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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference 4573 /MM/cvb	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP99/09718	International filing date (day/month/year) 09/12/1999	Priority date (day/month/year) 15/12/1998
International Patent Classification (IPC) or national classification and IPC C23C2/38		
Applicant N.V. BEKAERT S.A.et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 10 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 20/03/2000	Date of completion of this report 19.03.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Krafka, B Telephone No. +49 89 2399 8140 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/09718

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-7 as received on 29/06/2000 with letter of 23/06/2000

Claims, No.:

1-12 as received on 29/06/2000 with letter of 23/06/2000

Drawings, sheets:

1/1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/09718

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-7,10-12
	No:	Claims	8-9
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-12
Industrial applicability (IA)	Yes:	Claims	1-12
	No:	Claims	

2. Citations and explanations
see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP99/09718

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1: US-A-4 358 887 (CREPS JOHN A) 16 November 1982 (1982-11-16)
- D2: EP-A-0 791 453 (BRITISH STEEL CORP; DUNMORE CORP (US)) 27 August 1997 (1997-08-27)
- D3: US-A-4 774 105 (TAKAZAWA HISAYOSHI ET AL) 27 September 1988 (1988-09-27)
- D4: GB-A-2 077 762 (CONCORDE STEELWIRES PTE LTD) 23 December 1981 (1981-12-23)

Novelty and inventive step - Art. 33 (1),(2) and (3) PCT

1. In D1, Example 1, a method is disclosed how to provide a steel pipe which may also include flattened sections (column 4 line 16-23) with a metallic coating (column 5 lines 7-11) that renders the surface bright (column 5 line 43) and a subsequent transparent polyester film (column 5 lines 44-46). The subject-matter of Claim 8 does therefore not fulfill the requirements for novelty.
2. In column 1 line 9 of D1 the hot dip process is disclosed as a possible method to provide steel with a zinc coating. The subject-matter of Claim 9 is therefore also not considered to be novel. As under items 1 and 2, the subject-matters of Claims 8 and 9 are also not considered to involve an inventive step.
3. The combination of technical features as claimed in Claims 1-7 and 10-12 has not been disclosed in any of the prior art documents cited above. The subject-matter of Claims 1-7 and 10-12 is therefore regarded as novel.
4. The problem to be solved by the present invention can be seen in providing steel wire with a bright looking surface that will largely be maintained during the life of the wire. The solution presented by the applicant consists in two coating layers applied to the steel wire, a first, intermediate metallic one, which gives the bright-

ness to the steel wire, and immediately thereupon a second layer made of a transparent polymer. This combination of coatings has been proved to adhere to the steel surface and to ensure a lower friction coefficient than lacquer coatings, which have been previously described in the prior art.

Document D2 is chosen as closest prior art for the product, D1 as closest prior art for the method claimed in the present application.

5. D2 concerns a polymer coated steel substrate having an intermediate metallic coating (e.g. zinc, c. 1 l. 23-25). The colouring of a subsequent polymer film is envisaged to achieve optical effects (column 1 line 51). The colouring medium, a dye or pigment (column 1 line 51) is dispersed in the polymer (column 2 lines 28-30) which leaves the coloured polymer film transparent. As a preferred polymer polyethylene terephthalate is defined (column 2 line 37). A dye as defined in D2 (column 1 line 51) is understood to be an organic substance. D2 differs from the present application in that it uses a "bonding layer" between the metallic coating and the polymer film (c. 1 l. 38-43). D3 discloses a steel substrate such as a wire provided with an intermediate metallic coating and a subsequent polymer coating immediately upon the metallic layer (column 1 line 65 - column 2 line 3). Therefore, the subject-matter of Claims 1-6 is not considered to involve an inventive step over the combination of the teachings of documents D2 and D3.
6. The subject-matter of Claim 7 directed to the choice of Cu as the material for the intermediate metallic coating is considered to relate to an arbitrary selection, not associated with a non-obvious solution to a particular problem. It can therefore not be regarded to involve an inventive step.
7. Coatings on a steel strip, made preferable of polyethylene terephthalate, as disclosed in D2 are coloured by including the dye or pigment in the polymer (column 1 line 51). The subject-matter of Claim 10 does therefore not involve an inventive step.
8. In D4, which deals with metallic coatings on steel wires, wet-drawing is defined as a method to provide a "smooth, bright finish to the wire" (page 1 lines 46-47). The subject-matter of Claim 11 does therefore not involve an inventive step.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP99/09718

9. According to D2, column 1 line 52, the polymer film can be applied to the metal coated steel surface by an extrusion process. The provisions of Art. 33(3) PCT are therefore not fulfilled in respect of the subject-matter of Claim 12.

Re Item VI

Certain documents cited

Certain published documents (Rule 70.10)

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
CN-A-1 211 638	24/03/1999	14/02/1997	

Re Item VII

Certain defects in the international application

- a. The spelling of the term "terephthalate" is incorrect in the application documents.

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

To:

MESSELY, Marc
4011-D.I.E.
Bekaertstraat 2
B-8550 Zwevegem
BELGIQUE

Date of mailing
(day/month/year) 19.03.2001

Applicant's or agent's file reference
4573 /MM/cvb

IMPORTANT NOTIFICATION

International application No.
PCT/EP99/09718

International filing date (day/month/year)
09/12/1999

Priority date (day/month/year)
15/12/1998

Applicant
N.V. BEKAERT S.A.et al.

134
15/06/2001

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Christensen, J

Tel. +49 89 2399-8052



ATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 4573 /MM/cvb	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
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International Patent Classification (IPC) or national classification and IPC C23C2/38		
Applicant N.V. BEKAERT S.A.et al.		



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- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 20/03/2000	Date of completion of this report 19.03.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Krafka, B Telephone No. +49 89 2399 8140 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/09718

I. Basis of the report

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Description, pages:

1-7 as received on 29/06/2000 with letter of 23/06/2000

Claims, No.:

1-12 as received on 29/06/2000 with letter of 23/06/2000

Drawings, sheets:

1/1 as originally filed

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- ☐ contained in the international application in written form.
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- ☐ furnished subsequently to this Authority in written form.
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- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
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- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/09718

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1-7,10-12
	No:	Claims 8-9
Inventive step (IS)	Yes:	Claims
	No:	Claims 1-12
Industrial applicability (IA)	Yes:	Claims 1-12
	No:	Claims

2. Citations and explanations
see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

R Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1: US-A-4 358 887 (CREPS JOHN A) 16 November 1982 (1982-11-16)
- D2: EP-A-0 791 453 (BRITISH STEEL CORP; DUNMORE CORP (US)) 27 August 1997 (1997-08-27)
- D3: US-A-4 774 105 (TAKAZAWA HISAYOSHI ET AL) 27 September 1988 (1988-09-27)
- D4: GB-A-2 077 762 (CONCORDE STEELWIRES PTE LTD) 23 December 1981 (1981-12-23)

Novelty and inventive step - Art. 33 (1),(2) and (3) PCT

1. In D1, Example 1, a method is disclosed how to provide a steel pipe which may also include flattened sections (column 4 line 16-23) with a metallic coating (column 5 lines 7-11) that renders the surface bright (column 5 line 43) and a subsequent transparent polyester film (column 5 lines 44-46). The subject-matter of Claim 8 does therefore not fulfill the requirements for novelty.
2. In column 1 line 9 of D1 the hot dip process is disclosed as a possible method to provide steel with a zinc coating. The subject-matter of Claim 9 is therefore also not considered to be novel. As under items 1 and 2, the subject-matters of Claims 8 and 9 are also not considered to involve an inventive step.
3. The combination of technical features as claimed in Claims 1-7 and 10-12 has not been disclosed in any of the prior art documents cited above. The subject-matter of Claims 1-7 and 10-12 is therefore regarded as novel.
4. The problem to be solved by the present invention can be seen in providing steel wire with a bright looking surface that will largely be maintained during the life of the wire. The solution presented by the applicant consists in two coating layers applied to the steel wire, a first, intermediate metallic one, which gives the bright-

ness to the steel wire, and immediately thereupon a second layer made of a transparent polymer. This combination of coatings has been proved to adhere to the steel surface and to ensure a lower friction coefficient than lacquer coatings, which have been previously described in the prior art.

Document D2 is chosen as closest prior art for the product, D1 as closest prior art for the method claimed in the present application.

5. D2 concerns a polymer coated steel substrate having an intermediate metallic coating (e.g. zinc, c. 1 l. 23-25). The colouring of a subsequent polymer film is envisaged to achieve optical effects (column 1 line 51). The colouring medium, a dye or pigment (column 1 line 51) is dispersed in the polymer (column 2 lines 28-30) which leaves the coloured polymer film transparent. As a preferred polymer polyethylene terephthalate is defined (column 2 line 37). A dye as defined in D2 (column 1 line 51) is understood to be an organic substance. D2 differs from the present application in that it uses a "bonding layer" between the metallic coating and the polymer film (c. 1 l. 38-43). D3 discloses a steel substrate such as a wire provided with an intermediate metallic coating and a subsequent polymer coating immediately upon the metallic layer (column 1 line 65 - column 2 line 3). Therefore, the subject-matter of Claims 1-6 is not considered to involve an inventive step over the combination of the teachings of documents D2 and D3.
6. The subject-matter of Claim 7 directed to the choice of Cu as the material for the intermediate metallic coating is considered to relate to an arbitrary selection, not associated with a non-obvious solution to a particular problem. It can therefore not be regarded to involve an inventive step.
7. Coatings on a steel strip, made preferable of polyethylene terephthalate, as disclosed in D2 are coloured by including the dye or pigment in the polymer (column 1 line 51). The subject-matter of Claim 10 does therefore not involve an inventive step.
8. In D4, which deals with metallic coatings on steel wires, wet-drawing is defined as a method to provide a "smooth, bright finish to the wire" (page 1 lines 46-47). The subject-matter of Claim 11 does therefore not involve an inventive step.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP99/09718

9. According to D2, column 1 line 52, the polymer film can be applied to the metal coated steel surface by an extrusion process. The provisions of Art. 33(3) PCT are therefore not fulfilled in respect of the subject-matter of Claim 12.

Re Item VI

Certain documents cited

Certain published documents (Rule 70.10)

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
CN-A-1 211 638	24/03/1999	14/02/1997	

Re Item VII

Certain defects in the international application

- a. The spelling of the term "terephthalate" is incorrect in the application documents.

STEEL WIRE WITH BRIGHT LOOKING SURFACE

Field of the invention.

5 The present invention relates to a coated steel wire having a bright looking colored surface and to a method of manufacturing a coated steel wire having a bright looking colored surface.

Background of the invention.

10 A number of attempts have already been made to give to a steel wire a bright looking surface and to maintain an acceptable level of brightness during the life of the wire. All of these attempts, however, have some major disadvantages.

15 One of these attempts has consisted in galvanizing a steel wire and enameling the galvanized steel wire so that a lacquered wire is obtained. Such a lacquered wire has the advantage of having an excellent corrosion resistance due to the duplex layer "zinc + lacquer" and the advantage of offering a variety of colors. Experience, however, has shown that for applications where the wire is subjected to high
20 mechanical deformations, the lacquer does not stick on the surface of the wire due to its inherent lack of tenacity.

Still another problem is the relatively high coefficient of friction of lacquer coatings. This considerably slows down the speed of the downstream processing of the lacquered steel wire.

25

Summary of the invention.

It is an object of the present invention to provide a corrosion resistant steel wire with a bright, preferably colored surface.

30 It is another object of the present invention to provide a steel wire with a typical metallic looking color.

It is also an object of the present invention to provide a steel wire with transparent colored coating which conserves its transparency.

US-A-4 358 887 discloses a pipe, hot dipped with zinc and plastic coated with polyester. Between the zinc coating and the polyester coating is a chromate compound.

EP-A-0 791 453 discloses a galvanized strip. On the zinc coating is a bonding layer and on the bonding layer is a polymer coating such as a polyester coating with a dye.

-2-

It is still another object of the present invention to provide an adherent coating to a bright steel wire without much decreasing the original degree of brightness of the steel wire.

5 It is yet another object of the present invention to provide an environment friendly method of giving a bright metallic looking color to a steel wire.

According to a first aspect of the present invention, there is provided a steel wire with a bright looking and ~~preferably~~ colored surface. The steel wire is covered with an intermediate coating layer which gives the
10 brightness to the steel wire and is further ^{immediately} coated with a ~~polymer~~ being selected from the group consisting of thermoplastic polyester~~s~~,
~~polyimides, polyamides, polycarbonates, crystalline polyvinylchlorides~~
~~and polyphthalamides~~. This ~~polymer~~ is transparent. The ~~polymer~~ is
15 ~~preferably~~ colored, e.g. by comprising a transparent coloring agent, which can be added to the ~~polymer~~ in the form of small grains in a carrier of a similar or same ~~polymer~~. The coloring agent may be organic. An immediate advantage is that a variety of embodiments are possible depending upon the concentration and type of coloring agent. Metallic like colors and fluorescent colors may be applied to the steel wire in this
20 way.

In comparison with a lacquer coating, these transparent ^{polyesters} ~~polymers~~ are more tenacious and have a lower coefficient of friction. A friction force test demonstrates that a ~~nylon coating or a polyethylene terephthalate~~
25 coating provides a friction resistance which is three times smaller than the friction resistance of a zinc coating.

~~The group of polyimides comprises polyamide imide, polyester imide, polyether imide and polyanhydride. Polyamide imide, as a matter of~~
30 ~~example, provides a good adhesion and has a high melting point.~~

-3-

Preferably the coating is a thermoplastic polyester such as polyethylene terephthalate ("PET"), polybutylene terephthalate ("PBT") and polyethylene naphthenate ("PEN").

5 The most preferable embodiment amongst these is polyethylene terephthalate, since it combines the better properties such as high tenacity, low humidity absorption with a relatively low cost.

10 Within the context of the present invention, the terms "polyethylene terephthalate" or "PET" denote not only homopolymers of ethylene terephthalate but also copolymers of ethylene terephthalate containing not more than 20% of other copolymerized units, e.g. derived from other acids than terephthalic acid, such as isophthalic acid or from other glycols than ethylene glycol. The polymer may also contain mixtures of polymers in order to modify certain of the properties thereof.

15 The polyethylene terephthalate coating is more than 50% amorphous, and preferably more than 70% amorphous. This may be achieved by rapid cooling after the extrusion process. In comparison with a crystalline structure of the coating, an amorphous polyethylene terephthalate
20 coating, for example, has a more pronounced luster and is more flexible. Recrystallisation, however, may occur in course of time. In comparison with a PBT coating, recrystallisation happens much slower with a polyethylene terephthalate coating. This is an advantage for a polyethylene terephthalate coating over PBT coating.

25 In comparison with coatings of polyamides such as nylon-6 (PA6), a polyethylene terephthalate coating has a better adhesion and adhesion retention, has a higher corrosion resistance, has a better resistance against ultra-violet light (= better weatherability) and has a lower
30 absorption of water or moisture, and, as a consequence, maintains much better its original degree of transparency and luster. More particularly, polyethylene terephthalate coating absorbs only one tenth of the amount

-4-

of moisture absorbed by a nylon-6 coating in the same circumstances. Moreover, application of a polyethylene terephthalate coating can be done in an environment-friendly way, i.e. with a much more simpler pre-treatment without the use of chromic acids which would otherwise decrease the degree of brightness and without the use of primers which could also jeopardize the original degree of brightness.

One way of giving the original brightness to the steel wire is by applying an intermediate metallic coating such as a copper coating, a copper alloy coating such as bronze or brass, a zinc coating, a zinc alloy coating such as a 95% zinc 5% aluminum alloy, a nickel coating, a nickel alloy coating, a tin coating, or a tin alloy coating.

Another way of giving the original brightness to the steel wire is by applying an intermediate coating such as a copper-tin sulfate coating or a copper-sulfate coating.

The degree of brightness of the steel wire can be quantified on the bright intermediate coating of the steel wire, either before coating with the transparent polymer, or after removal of the transparent polymer. This quantification has the advantage of being independent of the color of the polymer and of the thickness of the polymer. The degree of brightness of the steel wire can also be quantified on the final steel wire, i.e. coated with the transparent polymer, but may have the disadvantage of being dependent upon the color of the polymer, if any, and upon the thickness of the polymer.

The quantification can be done either by determining the peripheral roughness of the steel wire or by determining the so-called L-value of the steel wire.

-5-

According to a second aspect of the present invention, there is provided a method of manufacturing a steel wire having a bright looking colored surface. The method comprises the following steps :

- (a) providing a steel wire ;
- 5 (b) coating the steel wire with an intermediate coating layer ;
- (c) giving a degree of brightness to the intermediate coating ;
- (d) coloring a polymer e.g. by adding a coloring agent to the polymer, where the polymer is selected from the group consisting of thermoplastic polyesters, polyimides, polyamides, polycarbonates and
- 10 polyphthalamides;
- (e) further coating the bright steel wire with the polymer (16).

The coating of the steel wire with the intermediate coating layer can be done by means of a hot dip operation, or by means of an electrolytic

15 coating process.

A required degree of brightness can be given to the intermediate coating layer by wet drawing the intermediately coated steel wire in a suitable lubricant.

20 However, wet drawing is not necessary to obtain the required degree of brightness. This required degree of brightness can also be obtained on the steel wire on its final diameter by suitably cooling the wire immediately after it leaves the bath in a hot dip galvanizing operation, or by electroplating the steel wire.

25 The further coating with a transparent polymer can be done by means of an extrusion process.

The invention is particularly applicable to steel wires which are subjected to high mechanical deformations.

30

For low carbon steel wire, which is steel wire with a carbon content below 0.20 %, following types of wires are subjected to high mechanical

-6-

deformations : bookbinding wire, box stapling wire, weaving wire, mattress wire, paper clip wire, coat hanger wire, bucket wire, tie wire, lamp shade wire, decoration wire, braiding wire, stitching wire ...

A typical diameter range for bookbinding wire is from 0.60 mm to 1.80 mm.

For high carbon steel wire, which is steel wire with a carbon content above 0.25 %, a spoke wire may be subjected to high mechanical deformation. A spoke wire coated according to the invention and having a fluorescent color may be particularly advantageous with respect to security.

Brief description of the drawings.

The invention will now be described into more detail with reference to the accompanying drawing being

- FIGURE 1, which shows a transversal cross-section of a steel wire according to the invention.

Description of a preferred embodiment of the invention.

FIGURE 1 represents a transversal cross-section of a steel wire according to the invention. The steel wire comprises a steel core, a thin coating of wet drawn zinc so that a bright appearance is obtained and an outer coating of transparent polyethylene terephthalate. The coating of polyethylene terephthalate comprises a transparent organic coloring agent which gives to the steel wire a bright and metallic like appearance.

Such a steel wire according to the invention can be manufactured as follows.

Starting material is a low carbon wire rod with a diameter of about 5.5 mm. This wire rod is dry drawn until an intermediate diameter of 3.0 mm. The thus drawn steel wire is subjected to heat treatment and is hot dip galvanized at this intermediate diameter of 3.0 mm. The galvanized

-7-

5 steel wire is now wet drawn in a soap solution until a final diameter of 1.2 mm. This wet drawing gives the galvanized steel wire its bright appearance. The drawn steel wire is degreased in order to remove all remaining drawing lubricants from the surface of the steel wire. Finally, a transparant polyethylene terephthalate coating with transparent organic coloring agents is applied to the steel wire. The thickness of the polyethylene terephthalate is coating is about 35 micrometer (35 μ m). Conveniently, these thicknesses range from 10 μ m to 200 μ m, preferably from 25 μ m to 50 μ m. Typical values are 35 μ m for bookbinding wire and 50 μ m for spoke wire.

10

The thus obtained invention steel wire is suitable for use as a bookbinding wire. The polyethylene terephthalate coating adheres well to the steel wire and can withstand the mechanical deformations to which a wires such as a bookbinding wire are normally subjected.

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-8-

CLAIMS

1. A coated steel wire (10) having a bright looking surface,
said steel wire (10) having a steel core (12),
5 said steel core (12) being covered with an intermediate coating layer
(14), *and immediately thereupon with*
~~said steel wire being further coated with a polymer (16) being~~
~~selected from the group consisting of thermoplastic polyester,~~
~~polyimides, polyamides, polyphtalamides, crystalline~~
10 ~~polyvinylchlorides and polycarbonates,~~
polyester
said *polymer* being transparent *and being colored.*
- ~~2. A steel wire according to claim 1, wherein said polymer is colored.~~
- 15 ~~2~~ *X*. A steel wire according to claim 1, said polymer comprising a
transparent coloring agent.
- 20 ~~3~~ *X*. A steel wire according to any one of the preceding claims,
wherein said polymer is a thermoplastic polyester selected from the
group consisting of polyethylene terephthalate, polybutylene
terephthalate and polyethylene naphthenate.
- ~~4~~ *X*. A steel wire according to claim ³~~3~~,
wherein said thermoplastic polyester is polyethylene terephthalate.
- 25 ~~5~~ *X*. A steel wire according to any one of the preceding claims,
wherein said coloring agent is organic.
- 30 ~~6~~ *X*. A steel wire according to any one of the preceding claims,
wherein said intermediate coating is a metallic coating such as a
copper coating, a copper alloy coating, a zinc coating, a zinc alloy
coating, a nickel coating, a nickel alloy, a tin coating or a tin alloy

-9-

coating.

7 ~~8~~. A steel wire according to any one of claims 1 to ⁵~~6~~,
 wherein said intermediate coating is a coating such as a copper-tin
 sulfate coating or a copper-sulfate coating.

8 ~~9~~. A method of manufacturing a coated steel wire (10) having a bright
 looking colored surface, said method comprising the following
 steps :

- 10 (a) providing a steel core (12) ;
 (b) coating said steel core (12) with an intermediate coating layer
 (14) ;
 (c) giving a degree of brightness to said intermediate coating (14) ;
 (d) using a transparent ~~polymer (16), said polymer being selected~~
 15 ~~from the group consisting of thermoplastic polyester, polyimides,~~
~~polyamides, polyphthalamides and polycarbonates ;~~
 (e) further coating said bright steel wire with said ~~polymer (16).~~
polyester

9 ~~10~~. A method according to claim ⁸~~9~~,
 20 wherein said coating with said intermediate coating layer is done by
 means of a hot dip operation.

10 ~~11~~. A method according to claim ⁸~~10~~ or ⁹~~11~~,
 said method further comprising the step of coloring said polymer.

25 11 ~~12~~. A method according to any one of claims ⁸~~11~~ to ¹⁰~~12~~,
 wherein said giving of a degree of brightness to said intermediate
 coating is done by wet drawing the coated steel wire.

30 12 ~~13~~. A method according to any one of claims ⁸~~12~~ to ¹⁰~~13~~,
 wherein said further coating with a polymer is done by an extrusion

- -10-

process.

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FOR THE PURPOSES OF INFORMATION ONLY

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STEEL WIRE WITH BRIGHT LOOKING SURFACE

Field of the invention.

5 The present invention relates to a coated steel wire having a bright looking colored surface and to a method of manufacturing a coated steel wire having a bright looking colored surface.

Background of the invention.

10 A number of attempts have already been made to give to a steel wire a bright looking surface and to maintain an acceptable level of brightness during the life of the wire. All of these attempts, however, have some major disadvantages.

15 One of these attempts has consisted in galvanizing a steel wire and enameling the galvanized steel wire so that a lacquered wire is obtained. Such a lacquered wire has the advantage of having an excellent corrosion resistance due to the duplex layer "zinc + lacquer" and the advantage of offering a variety of colors. Experience, however, has shown that for applications where the wire is subjected to high
20 mechanical deformations, the lacquer does not stick on the surface of the wire due to its inherent lack of tenacity.

Still another problem is the relatively high coefficient of friction of lacquer coatings. This considerably slows down the speed of the downstream processing of the lacquered steel wire.

25

Summary of the invention.

It is an object of the present invention to provide a corrosion resistant steel wire with a bright, preferably colored surface.

30 It is another object of the present invention to provide a steel wire with a typical metallic looking color.

It is also an object of the present invention to provide a steel wire with transparent colored coating which conserves its transparency.

-2-

It is still another object of the present invention to provide an adherent coating to a bright steel wire without much decreasing the original degree of brightness of the steel wire.

It is yet another object of the present invention to provide an environment friendly method of giving a bright metallic looking color to a steel wire.

According to a first aspect of the present invention, there is provided a steel wire with a bright looking and preferably colored surface. The steel wire is covered with an intermediate coating layer which gives the brightness to the steel wire and is further coated with a polymer being selected from the group consisting of thermoplastic polyesters, polyimides, polyamides, polycarbonates, crystalline polyvinylchlorides and polyphthalamides. This polymer is transparent. The polymer is preferably colored, e.g. by comprising a transparent coloring agent, which can be added to the polymer in the form of small grains in a carrier of a similar or same polymer. The coloring agent may be organic. An immediate advantage is that a variety of embodiments are possible depending upon the concentration and type of coloring agent. Metallic like colors and fluorescent colors may be applied to the steel wire in this way.

In comparison with a lacquer coating, these transparent polymers are more tenacious and have a lower coefficient of friction. A friction force test demonstrates that a nylon coating or a polyethylene terephthalate coating provides a friction resistance which is three times smaller than the friction resistance of a zinc coating.

The group of polyimides comprises polyamide imide, polyester imide, polyether imide and polyanil imide. Polyamide imide, as a matter of example, provides a good adhesion and has a high melting point.

-3-

Preferably the coating is a thermoplastic polyester such as polyethylene terephthalate ("PET"), polybutylene terephthalate ("PBT") and polyethylene naphthalene ("PEN").

5 The most preferable embodiment amongst these is polyethylene terephthalate, since it combines the better properties such as high tenacity, low humidity absorption with a relatively low cost.

10 Within the context of the present invention, the terms "polyethylene terephthalate" or "PET" denote not only homopolymers of ethylene terephthalate but also copolymers of ethylene terephthalate containing not more than 20% of other copolymerized units, e.g. derived from other acids than terephthalic acid, such as isophthalic acid or from other glycols than ethylene glycol. The polymer may also contain mixtures of polymers in order to modify certain of the properties thereof.

15 The polyethylene terephthalate coating is more than 50% amorphous, and preferably more than 70% amorphous. This may be achieved by rapid cooling after the extrusion process. In comparison with a crystalline structure of the coating, an amorphous polyethylene terephthalate coating, for example, has a more pronounced luster and is more flexible. Recrystallisation, however, may occur in course of time. In comparison with a PBT coating, recrystallisation happens much slower with a polyethylene terephthalate coating. This is an advantage for a polyethylene terephthalate coating over PBT coating.

25 In comparison with coatings of polyamides such as nylon-6 (PA6), a polyethylene terephthalate coating has a better adhesion and adhesion retention, has a higher corrosion resistance, has a better resistance against ultra-violet light (= better weatherability) and has a lower absorption of water or moisture, and, as a consequence, maintains much better its original degree of transparency and luster. More particularly, polyethylene terephthalate coating absorbs only one tenth of the amount

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-4-

of moisture absorbed by a nylon-6 coating in the same circumstances. Moreover, application of a polyethylene terephthalate coating can be done in an environment-friendly way, i.e. with a much more simpler pre-treatment without the use of chromic acids which would otherwise decrease the degree of brightness and without the use of primers which could also jeopardize the original degree of brightness.

One way of giving the original brightness to the steel wire is by applying an intermediate metallic coating such as a copper coating, a copper alloy coating such as bronze or brass, a zinc coating, a zinc alloy coating such as a 95% zinc 5% aluminum alloy, a nickel coating, a nickel alloy coating, a tin coating, or a tin alloy coating.

Another way of giving the original brightness to the steel wire is by applying an intermediate coating such as a copper-tin sulfate coating or a copper-sulfate coating.

The degree of brightness of the steel wire can be quantified on the bright intermediate coating of the steel wire, either before coating with the transparent polymer, or after removal of the transparent polymer. This quantification has the advantage of being independent of the color of the polymer and of the thickness of the polymer. The degree of brightness of the steel wire can also be quantified on the final steel wire, i.e. coated with the transparent polymer, but may have the disadvantage of being dependent upon the color of the polymer, if any, and upon the thickness of the polymer.

The quantification can be done either by determining the peripheral roughness of the steel wire or by determining the so-called L-value of the steel wire.

-5-

According to a second aspect of the present invention, there is provided a method of manufacturing a steel wire having a bright looking colored surface. The method comprises the following steps :

- (a) providing a steel wire ;
- 5 (b) coating the steel wire with an intermediate coating layer ;
- (c) giving a degree of brightness to the intermediate coating ;
- (d) coloring a polymer e.g. by adding a coloring agent to the polymer, where the polymer is selected from the group consisting of thermoplastic polyesters, polyimides, polyamides, polycarbonates and
- 10 polyphthalamides;
- (e) further coating the bright steel wire with the polymer (16).

The coating of the steel wire with the intermediate coating layer can be done by means of a hot dip operation, or by means of an electrolytic

15 coating process.

A required degree of brightness can be given to the intermediate coating layer by wet drawing the intermediately coated steel wire in a suitable lubricant.

20 However, wet drawing is not necessary to obtain the required degree of brightness. This required degree of brightness can also be obtained on the steel wire on its final diameter by suitably cooling the wire immediately after it leaves the bath in a hot dip galvanizing operation, or by electroplating the steel wire.

25 The further coating with a transparent polymer can be done by means of an extrusion process.

The invention is particularly applicable to steel wires which are subjected to high mechanical deformations.

30

For low carbon steel wire, which is steel wire with a carbon content below 0.20 %, following types of wires are subjected to high mechanical

deformations : bookbinding wire, box stapling wire, weaving wire, mattress wire, paper clip wire, coat hanger wire, bucket wire, tie wire, lamp shade wire, decoration wire, braiding wire, stitching wire ...

A typical diameter range for bookbinding wire is from 0.60 mm to 1.80 mm.

For high carbon steel wire, which is steel wire with a carbon content above 0.25 %, a spoke wire may be subjected to high mechanical deformation. A spoke wire coated according to the invention and having a fluorescent color may be particularly advantageous with respect to security.

Brief description of the drawings.

The invention will now be described into more detail with reference to the accompanying drawing being

- FIGURE 1, which shows a transversal cross-section of a steel wire according to the invention.

Description of a preferred embodiment of the invention.

FIGURE 1 represents a transversal cross-section of a steel wire 10 according to the invention. The steel wire 10 comprises a steel core 12, a thin coating 14 of wet drawn zinc so that a bright appearance is obtained and an outer coating 16 of transparent polyethelene teraphthalate. The coating 16 of polyethylene teraphthalate comprises a transparent organic coloring agent which gives to the steel wire 10 a bright and metallic like appearance.

Such a steel wire according to the invention can be manufactured as follows.

Starting material is a low carbon wire rod with a diameter of about 5.5 mm. This wire rod is dry drawn until an intermediate diameter of 3.0 mm. The thus drawn steel wire is subjected to heat treatment and is hot dip galvanized at this intermediate diameter of 3.0 mm. The galvanized

steel wire is now wet drawn in a soap solution until a final diameter of 1.2 mm. This wet drawing gives the galvanized steel wire its bright appearance. The drawn steel wire is degreased in order to remove all remaining drawing lubricants from the surface of the steel wire. Finally,
5 a transparant polyethylene teraphtalate coating with transparent organic coloring agents is applied to the steel wire. The thickness of the polyethylene teraphtalate is coating is about 35 micrometer (35 μm). Conveniently, these thicknesses range from 10 μm to 200 μm , preferably from 25 μm to 50 μm . Typical values are 35 μm for bookbinding wire
10 and 50 μm for spoke wire.

The thus obtained invention steel wire is suitable for use as a bookbinding wire. The polyethylene teraphtalate coating adheres well to the steel wire and can withstand the mechanical deformations to which a
15 wires such as a bookbinding wire are normally subjected.

CLAIMS

1. A coated steel wire (10) having a bright looking surface,
said steel wire (10) having a steel core (12),
5 said steel core (12) being covered with an intermediate coating layer
(14),
said steel wire being further coated with a polymer (16) being
selected from the group consisting of thermoplastic polyesters,
polyimides, polyamides, polyphtalamides, crystalline
10 polyvinylchlorides and polycarbonates,
said polymer being transparent.
2. A steel wire according to claim 1, wherein said polymer is colored.
- 15 3. A steel wire according to claim 1, said polymer comprising a
transparent coloring agent.
4. A steel wire according to any one of the preceding claims,
wherein said polymer is a thermoplastic polyester selected from the
20 group consisting of polyethylene terephthalate, polybutylene
terephthalate and polyethylene naphthenate.
5. A steel wire according to claim 4,
wherein said thermoplastic polyester is polyethylene terephthalate.
25
6. A steel wire according to any one of the preceding claims,
wherein said coloring agent is organic.
7. A steel wire according to any one of the preceding claims,
30 wherein said intermediate coating is a metallic coating such as a
copper coating, a copper alloy coating, a zinc coating, a zinc alloy
coating, a nickel coating, a nickel alloy, a tin coating or a tin alloy

coating.

8. A steel wire according to any one of claims 1 to 6,
wherein said intermediate coating is a coating such as a copper-tin
5 sulfate coating or a copper-sulfate coating.
9. A method of manufacturing a coated steel wire (10) having a bright
looking colored surface, said method comprising the following
steps :
10 (a) providing a steel core (12) ;
(b) coating said steel core (12) with an intermediate coating layer
(14) ;
(c) giving a degree of brightness to said intermediate coating (14) ;
(d) using a transparent polymer (16), said polymer being selected
15 from the group consisting of thermoplastic polyesters, polyimides,
polyamides, polyphthalamides and polycarbonates ;
(e) further coating said bright steel wire with said polymer (16).
10. A method according to claim 9,
20 wherein said coating with said intermediate coating layer is done by
means of a hot dip operation.
11. A method according to claim 9 or 10,
said method further comprising the step of coloring said polymer.
25
12. A method according to any one of claims 9 to 11,
wherein said giving of a degree of brightness to said intermediate
coating is done by wet drawing the coated steel wire.
13. A method according to any one of claims 9 to 11,
30 wherein said further coating with a polymer is done by an extrusion

-10-

process.

5

1 / 1

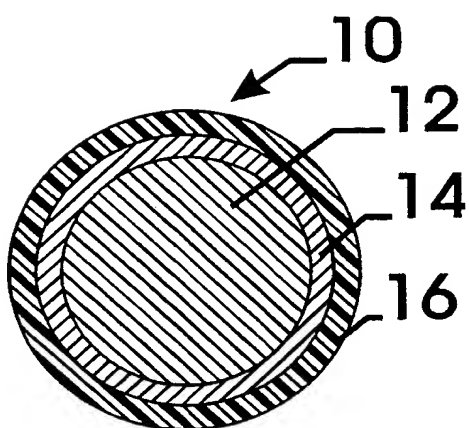


Fig. 1

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing: 22 June 2000 (22.06.00)	
International application No.: PCT/EP99/09718	Applicant's or agent's file reference: 4573
International filing date: 09 December 1999 (09.12.99)	Priority date: 15 December 1998 (15.12.98)
Applicant: ADRIAENSEN, Ludo et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:
20 March 2000 (20.03.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer:</p> <p>J. Zahra</p> <p>Telephone No.: (41-22) 338.83.38</p>
--	--

PATENT COOPERATION TREATY

28 FEB. 2000

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

T :
MESSELY, Marc
4011-D.I.E.
Bekaertstraat 2
B-8550 Zwevegem
BELGIUM

Date of mailing
(day/month/year) **24/02/2000**

Applicant's or agent's file reference
4573

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.
PCT/EP 99/09718

International filing date
(day/month/year) **09/12/1999**

Applicant

N.V. BEKAERT S.A. et al.

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90b/s.1 and 90b/s.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Maria Van der Hoeven

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 4573	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 99/ 09718	International filing date (day/month/year) 09/12/1999	(Earliest) Priority Date (day/month/year) 15/12/1998
Applicant N.V. BEKAERT S.A.et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 39.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/09718

A. CLASSIFICATION F. SUBJECT MATTER
 IPC 7 C23C2/38 C23C 6 C23C28/00 B05D7/20 29C47/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C23C B05D B29C B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 4 358 887 A (CREPS JOHN A) 16 November 1982 (1982-11-16) abstract; claims 1,6,7; figures 1,6 column 1, line 7 - line 14 column 1, line 50 - line 59 column 2, line 3 - line 15 column 2, line 39 - column 3, line 2 column 3, line 25 - line 42 column 5, line 42 - line 63	1,7,9,10 4,5 12,13
X Y	US 4 774 105 A (TAKAZAWA HISAYOSHI ET AL) 27 September 1988 (1988-09-27) abstract; figure 1 column 1, line 65 - column 2, line 5 column 2, line 14 - line 41 claims; example 2	1,6 9,10,12, 13
	— — — — — -/-	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier document but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"A" document member of the same patent family

Date of the actual completion of the international search

10 February 2000

Date of mailing of the international search report

24/02/2000

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Ceulemans, J

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/09718

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 829 545 A (VLAENDEREN ROGER VAN) 13 August 1974 (1974-08-13) column 1, line 13 - line 21 column 2, line 18 - line 51 column 3, line 18 - line 37 column 4, line 7 - line 38 column 4, line 65 - column 5, line 39 claim 1; figures	4, 5, 9, 10, 13
Y	GB 2 077 762 A (CONCORDE STEELWIRES PTE LTD) 23 December 1981 (1981-12-23) page 1, line 46 - line 49 claims	9, 10, 12
A	DE 196 25 548 A (SCHLOEMANN SIEMAG AG) 2 January 1998 (1998-01-02) the whole document	1, 2, 9-11, 13
A	EP 0 791 453 A (BRITISH STEEL CORP ;DUNMORE CORP (US)) 27 August 1997 (1997-08-27) claims 1-3, 7-13	2-6
P, A	DATABASE WPI Week 9931 Derwent Publications Ltd., London, GB; AN 358452 XP002130277 "Quick acidic bright copper-plating technique for low-carbon steel wire" & CN 1 211 638 A (SUN B.), 24 March 1999 (1999-03-24) abstract	8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 99/09718

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4358887	A	16-11-1982	NONE	
US 4774105	A	27-09-1988	JP 1919254 C JP 6049173 B JP 62071571 A	07-04-1995 29-06-1994 02-04-1987
US 3829545	A	13-08-1974	NL 7001315 A AT 326899 B BE 761408 A CA 956426 A CH 530261 A DE 2104271 A DK 146236 B FR 2077389 A GB 1322114 A LU 62500 A SE 368170 B ES 387739 A NO 135740 B US 3893642 A	02-08-1971 12-01-1976 16-06-1971 22-10-1974 15-11-1972 05-08-1971 08-08-1983 22-10-1971 04-07-1973 11-08-1971 24-06-1974 16-05-1973 14-02-1977 08-07-1975
GB 2077762	A	23-12-1981	NONE	
DE 19625548	A	02-01-1998	NONE	
EP 0791453	A	27-08-1997	GB 2309931 A	13-08-1997
CN 1211638	A	24-03-1999	NONE	